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Abstract

INSTRUMENTATION AND CONTROL OF LARGE GAS-COOLED REACTORS

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Since the design of the first British gas-cooled power reactors some 5 - 7 years ago, work has proceeded to simplify operational control and improve reliability. In this paper three aspects of this are discussed, improvements to main control displays, and the application of solid state techniques to safety circuits and to control rod supplies.

The application of large data processing units, now available in a proved and reliable form has facilitated increased centralisation of the control function. The information from the plant amounting to perhaps 7,000 readings on a two reactor station is processed and only the information required by the operators is displayed. The use of cathode ray tubes on which alpha-numeric information can be reproduced, provides the necessary flexibility for this application. Corresponding improvements are also described for the panels housing the controls.

Until recently, all the British civil nuclear power reactors have employed electro magnetic relays in the protection systems. To improve the inherent safety of a protection system, and reduce maintenance testing to a minimum, the application of solid state switching devices has been studied and the "Laddic" has been found to fulfil safety requirements. The "Laddic" is a multi-aperture

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ferrite core, upon which logic may be performed and its development for this purpose is described together with its application to a reactor protection system.

Low frequency supplies in the range 0-1 cycle/second, are provided to operate the control rod actuator in power reactors. This arrangement obviates the need for clutches and high ratio gear trains within the reactor. The low frequency supplies, derived in the early reactors from rotating plant, are now derived from static generating equipment employing magnetic amplifiers or thyristors, which modulate the output of the equipment to give the low frequency required. To guard against the lack of inertia in a static generating system features are incorporated to maintain the low frequency supplies during transient disturbances on the mains supply, thus enhancing reactor availability.